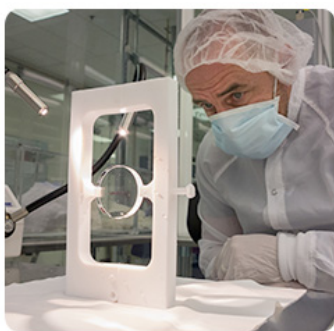


## LIVERMORE LAB REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory March 17-21, 2014.

### *The New York Times*    THE LITTLE STAR THAT COULD



**A chemist examines a fused silica test optic used in the target fabrication process for the National Ignition Facility.**

Fusion, the process that powers the sun and the stars, has been a lifelong pursuit for many scientists.

But Lawrence Livermore scientists have given the world some hopeful progress. Last month, a team headed by Omar Hurricane announced that it had used Livermore's National Ignition Facility to fuse hydrogen atoms and produce a flash of energy, like a miniature star. The amount of energy produced was tiny -- the equivalent of what a 60-watt light bulb consumes in five minutes. But that was five times the output of attempts a couple of years ago.

To read more, go to [The New York Times](#).

### COMPUTERWORLD    HAPPY BIRTHDAY WORLD WIDE WEB



### **Dona Crawford**

Last week, the Web marked its 25th anniversary. On March 12, 1989, Tim Berners-Lee, a British computer scientist, introduced the idea of the World Wide Web in a proposal for an information system.

The Web has changed the way people work, share their lives with family and friends and even play games.

In a *Computerworld* article, Dona Crawford, Lawrence Livermore's Computation associate director, reflects on how the Web plays a critical role in climate change research.

To read more, go to [Computerworld](#).



**IT'S HOT, HOT, HOT**



### **Researchers are exploring the interiors of giant planets such as Saturn.**

Lawrence Livermore researchers and international colleagues have heated hydrogen from minus 253 to 12,000 degrees Celsius almost instantaneously to observe what happens to the lower atmosphere of giant gas planets such as Jupiter or Saturn.

The team was able to see the properties of the element during the heating process. Their observations reveal how liquid hydrogen becomes a plasma and provide information on the material's thermal conductivity and internal energy exchange, which are important ingredients for planetary models.

"Some of hydrogen's properties at such extreme conditions remain uncertain despite our very good theoretical models," says Tilo Doeppner, a Lawrence Livermore physicist and co-author on a recent paper in *Physical Review Letters*. "It is very challenging to perform quantitative experiments on dense hydrogen at conditions that approach those found in the interior of planets."

To read more, go to [Photonics Online](#).

## POPULAR SCIENCE

### FEEL THE RECYCLED HEAT



**Leftover heat from a gas burner used to heat up a water heater could be used to heat a home.**

Recycling heat is quite common in Europe. Denmark gets roughly half of its electricity from recycled heat, followed by Finland at 39 percent, and Russia at 31 percent. In the U.S., it's just 12 percent.

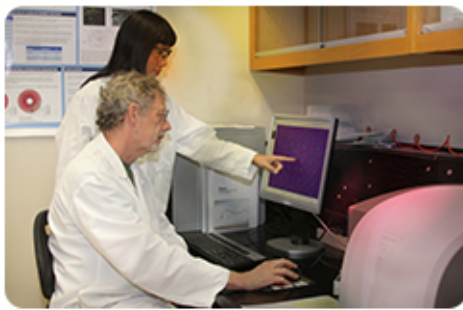
But it may be some time before the United States increases that percentage. According to a report by Lawrence Livermore, the U.S. wastes more than half of the total energy we produce -- mostly as heat, but also as gas, biomass and methane. Using that waste could reduce carbon dioxide emissions by 17 percent.

Recycling heat can be quite simple. For example, new buildings often have condensing water heaters, which use gas burners to warm up water (just as other heaters do) but also capture the

heat in the combusted gas that's going out the flue. That captured heat could be used to heat the building.

To read more, go to [Popular Science](#).

## CONTRA COSTA TIMES DNA PROVIDES CLUE TO KILLER DISEASES



**LLNL biologist Crystal Jaing and computer scientist Kevin McLoughlin analyze an image from the Lawrence Livermore Microbial Detection Array (LLMDA). The LLMDA has been used for the first time to study pathogens from ancient human remains.**

Lawrence Livermore scientists and colleagues have turned to a novel kind of DNA detection technology to uncover clues on how devastating historical pandemics like the Black Death and cholera came about, and what made them so deadly.

For the first time, using the Lawrence Livermore Microbial Detection Array (LLMDA) -- a technology developed at Lawrence Livermore that can identify bacteria, viruses and other organisms -- Livermore lab researchers and scientists from McMaster University in Ontario, Canada have successfully identified disease-causing pathogens from ancient human remains.

Lab scientists say the study shows microarrays -- which can detect pathogens more efficiently than traditional genome sequencing -- could lead to better understanding of the evolution of diseases and even predict future outbreaks.

To read more, go to the [Contra Costa Times](#).

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LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance. To send input to the *Livermore Lab Report*, send [e-mail](#)